organisms" from the plankton for the detection of oceanic currents, especially with changing shore conditions, should be chosen with care.

C. A. K.

PHYSIOLOGY.

Ocular Accommodation. — For several years past Dr. Theodor Beer,[1] of the University of Vienna, has been investigating ocular accommodation in those animals which possess well-developed camera eyes, and has presented in a lecture before the Fourth International Congress of Physiologists an admirable survey of this subject. According to him such water animals as the dibranchiate cephalopods and the bony fishes possess eyes which in the resting condition are accommodated for short distances, and which require active accommodation for vision at long distances. This is brought about by shifting the lens, without changing its curvature, from a distant position to one nearer the retina. In the cephalopods this shifting is accomplished by the contraction of a ring-shaped muscle which works against the deeper contents of the eyeball. In the bony fishes a band-like muscle, the retractor of the lens, draws that body inward toward the retina.

In the air-inhabiting vertebrates the resting eye is accommodated for distant vision. Near vision is possible only by active accommodation. This is accomplished in one of two ways: either the lens, unchanged in form, is moved away from the retina, as in amphibians and most snakes, or the convexity of the outer surface of the lens is increased, as in a few snakes, the turtles, crocodiles, lizards, birds, and mammals. The outward movement of the lens is brought about by an increase of pressure in the vitreous humor, produced by muscular contraction; the change in the convexity of the lens is induced by the well-known indirect action of the ciliary muscle.

In all the groups of animals examined, with the exception of the cephalopods and the birds, some species were found in which accommodation was entirely or almost entirely absent; such, for instance, was the case in the cartilaginous fishes, the sea eels, haddock, frogs, toads, salamanders, alligators, some lizards, vipers, and many rodents. Many of these are night animals, and possess in the daytime so small

[1] Beer, T. Die Accommodation des Auges in der Thierreihe, *Wiener klinischen Wochenschrift*, Nr. 42, Jahrgang 1898.

a pupil that the images on their retinas are formed by this opening rather than by the lens, which is thus in a measure functionless.

Most vertebrates are unable to accommodate their eyes so that they can see equally well in water and in air. Water animals when in the air are extremely shortsighted; air-inhabiting forms when in water are very farsighted. Only some few vertebrates, such as the pond turtles which seek their prey both by land and water, seem to see well on land and yet accommodate for near vision in water.

Those animals that accommodate by moving their lenses (cephalopods, fish, amphibia, and some snakes) presumably suffer no special loss of this power as age advances. Those whose accommodation depends upon a change in the form of the lens, brought about through its elasticity (most reptiles, birds, and mammals), probably suffer as the human being does, and become permanently farsighted as age advances. G. H. P.

The Sense of Hearing is the subject of a popular discourse delivered by Dr. K. Vohsen[1] before the Senckenberg Natural History Society and published in their proceedings. The speaker calls attention to the relation between speech and hearing, and shows in a table the zoölogical distribution of sound-producing and sound-perceiving organs. While almost all animals possess the latter, only arthropods and vertebrates possess the former. The auditory vesicles of the invertebrates, as well as the inner ears of the vertebrates, are described. Only a hint is given that the so-called auditory organs of the lower animals may also be concerned with the function of equilibration, and no mention is made of the fact that, in the cases most carefully examined, equilibrations seem to be the exclusive function of these parts. The lecture contains an excellent table showing the range of hearing in the human ear, and the complex question of the analysis of sound by the ear is considered. G. H. P.

Physiology for Schools. — In a little book of Laboratory Exercises[2] Mr. James Edward Peabody has done a good work, for which many teachers will be grateful. By series of skillfully framed questions upon objects readily accessible, the pupil is led to exert his

[1] Vohsen, K. Über den Gehörsinn, *Bericht d. Senckenberg. naturf. Gesell.*, 1898, pp. 91–112.

[2] Peabody, J. E., Instructor in Biology in the High School for Boys and Girls, New York City. *Laboratory Exercises in Anatomy and Physiology.* New York, Henry Holt & Co., 1898. Cloth, x + 78 pp., interleaved.